

ORIGINAL RESEARCH:
EMPIRICAL RESEARCH - QUANTITATIVE

Nurses' assessments of staffing adequacy in care services for older patients following hospital discharge

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Abstract

Aims: To explore community nurses' assessments of staffing adequacy in care provision for older patients following hospital discharge and analyse the extent to which their assessments are associated with characteristics of the system level of municipality and vertical coordination between hospital and community care services.

Design: Nation-wide cross-sectional survey.

Methods: Web-based survey conducted in 2017 among 3,461 nurses working with older persons (65+) in homecare services, residential care and nursing homes in Norway. Responses from individual homecare nurses were linked with municipal-level register data (age structure, economic flexibility, service profiles). Stratified multilevel analyses were used to analyse the association of staffing adequacy with municipal characteristics and perceived quality of vertical coordination.

Results: Almost half of the nurses experienced inadequate staffing in general, whereas a similar share indicated that staffing was adequate. Nursing home nurses showed the least positive ratings of staffing adequacy. Most nurses indicated that there were too many unqualified care workers at their workplace. More positive assessments of staffing adequacy were associated with better vertical coordination. Average ratings of staffing adequacy were lower in larger municipalities and municipalities with an older population.

Conclusion: Healthcare providers, nurse managers and policy makers may benefit from a stronger focus on rebalancing skill-mix and on new models of vertical coordination in addressing current and future nurse staffing shortages in care services for older people following hospital discharge.

Impact statement: This study adds to the scarce national and international research literature on nurse staffing in community care services, addressing the pressing challenges of staffing and skill-mix in long-term care provision. Findings support the development of nurse-led models of care coordination for older patients following hospital discharge and stimulate future research on the effects of recruitment and retention strategies in different municipalities and different models of vertical coordination.

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KEYWORDS

care transitions, community healthcare services, coordination, multilevel, nurses, older people, quantitative, staffing, survey, system context

1 | INTRODUCTION

Nursing staff shortage in community healthcare services is a recurring concern reported in surveys and interviews (Bratt & Gautun, 2018; Buchan & Dal Poz, 2002; Foot et al., 2014; Gautun & Syse, 2017; Haukelien et al., 2015; Koopmans et al., 2018) and is supported by statistics at the national level (Andreev & Ørborg, 2014; OECD, 2019). Projections indicate a substantial growth in future demands for registered as well as licensed practical nurses in community care services (Holmøy et al., 2016; NOU, 2019). Important drivers for this anticipated growth are the expected increase in the number of older people with long-term health problems, earlier hospital discharge of patients with more serious or complicated medical problems and advances in healthcare technologies that imply an increased need for nursing care at home (Fields & Brett, 2015). Several countries have introduced major reforms to reorganize care in line with these developments (Norwegian Ministry of Health & Care Services, 2008; Spasova et al., 2018). Consequently, a larger proportion of health services is currently being transferred from specialized hospital services to community care settings (Gautun & Syse, 2017; Spasova et al., 2018). This, in turn, has contributed to a further increase in responsibilities for community nurses towards more older people with complex care needs (Gautun & Syse, 2017; Kassah & Tønnessen, 2016; Meld. St.26, 2014–2015). So far, the increased demands have not been met by sufficient increases in capacity (Riksrevisjonen, 2016) and there is a general concern in many European countries about a decreasing workforce that is inadequately prepared (Koopmans et al., 2018).

Having sufficient staff has an intuitive appeal for a positive impact on care quality. Low nurse staffing levels in local care settings are associated with poorer user experiences (Griffiths et al., 2011), hospital readmissions (Glette et al., 2018) and less continuity of care (Belling et al., 2011; Koopmans et al., 2018). Other studies have underlined the ambiguousness of these associations (Backhaus et al., 2014; Griffiths et al., 2016). One issue is the number of staff and the distribution of staff groups (staff ratio); another is the skill-mix to provide the care that is needed (Bing-Jonsson et al., 2016; Dubois & Singh, 2009; Helsedirektoratet, 2014; Sibbald et al., 2004). At the services level, the issue of workforce supply raises recruitment and retention challenges for managers (Hurst, 2006; Schwartz, 2012). In Norway, additional challenges related to high levels of sickness absence and part-time work (Helsedirektoratet, 2014; Vabø et al., 2019). There is no single staff-to-patient ratio that can be applied across the entire range of community care settings to safely meet users care needs (Bratt & Gautun, 2015; Mitchell et al., 2017). Thus, community nurses' own assessments of staffing adequacy provide fundamental input to developing safe local staffing guidelines.

There is little knowledge of staffing adequacy in community healthcare settings, as most research tends to focus on staffing in acute inpatient hospital settings. This paper addresses this gap by exploring variation in community nurses' assessments of staffing adequacy in care provision for older patients following hospital discharge.

1.1 | Background

Staffing and skill mix are both determinants and determined by, organizational and system context (Buchan & Dal Poz, 2002). Community healthcare services in Norway, as well as in many other countries, are the responsibility of the local authorities, that is the municipality, whereas the central government is responsible for hospital care (Ringard et al., 2013; Romoren et al., 2011). The relatively autonomous role of municipalities has led to large variations across municipalities in service profiles (e.g. emphasis on home-based versus institutional services) and coverage rates (Førland & Rostad, 2019) and in the allocation practices involving homecare services to older people (Holm et al., 2017; Riksrevisjonen, 2016; Syse et al., 2015). Staffing ratios and skill-mix vary greatly between municipalities, with staffing ratios in some municipalities being up to five times higher than others (Røhne et al., 2017). Such inter-municipal variations partly reflect compositional differences related to age structure, the need for care, economic flexibility and geographical distances in the municipality (Gautun & Syse, 2017; Langørgen, 2004). For example municipalities with a large share of older people (80 years and older) may have greater pressure on their care services. Community nurses working in the same municipality are thus likely to have more similar assessments of staffing adequacy. Nurses working in municipalities with relatively high and flexible financial resources may consider themselves to be in a better position to provide services than nurses working in municipalities constrained by budgetary considerations. Nurses in these latter settings may experience a more pronounced lack of resources to deal with the extra burden of additional discharged older patients from the hospital. Economic flexibility has been greater in smaller than larger municipalities, largely due to the inherent characteristics of the previous financial reimbursement systems. As such, smaller municipalities have been better equipped to finance necessary personnel in the local care sector, although the supply of qualified health workers is more favourable in larger municipalities. Furthermore, municipalities with an emphasis on institutional (nursing home) care may be better equipped to provide care for older people with more complex care needs, whereas municipalities with a strong focus on home-based services may have a greater capacity to handle a larger number of older patients discharged from the hospital. In sum, community nurses' assessments of staffing adequacy are likely to be more negative in geographically dispersed municipalities with little economic flexibility, a relatively old population, a

stronger focus on nursing homes and with a lower number of fulltime equivalents (FTE's) in community care.

The earlier discharge of frail older patients to community care settings brings together organizations and staff that deliver different services and thus stimulates a need for increased vertical coordination where nurses play a pivotal role (Payne et al., 2002). Nurses coordinate the contact between the hospital and the community care services. The hospital nurse usually notifies the co-ordinator in a patient's municipality that he or she needs follow-up in community care services, prepares the medical information and a nursing report to accompany the patient at discharge. Community care nurses seek information on the patient's medical and functional status and make practical preparations. The coordination between hospital and community care nurses in the discharge of older patients have the characteristics of a collaborative chain, that is 'relatively independent work performed in a sequential flow of tasks where the actors involved relate to each other asymmetrically' (p.2, Paulsen et al., 2013). Problems in vertical coordination arise because the two settings (hospital and community care services) are both under pressure, with separate financial and organizational structures and are pursuing different professional goals (Knutsen Glette et al., 2019). Neither setting is fully aware of the needs, limitations and pressures of the other (Payne et al., 2002; Petersen et al., 2019). For example where community nurses repeatedly consider that the hospital discharges patients too soon, hospital nurses think that community nurses take too long to prepare safe post-hospital care conditions (Hellesø & Fagermoen, 2010). Poor coordination across care levels leads to increased workloads and inefficient use of staffing (Mur-Veeman et al., 2008) as homecare nurses spend a disproportionate amount of time on gathering necessary patient information (Anderson et al., 2012; Melby et al., 2018) and on the organization of work (Allan, 2014). Thus, poor vertical coordination is likely to contribute to perceptions of inadequate staffing among community nurses. We know of no previous studies that have investigated this association empirically.

2 | THE STUDY

2.1 | Aims

This study is the first nation-wide multilevel study of staffing adequacy as assessed by community nurses nested within municipalities. Our main aim is to explore variation in community nurses' assessments of staffing adequacy in care provision for older patients following hospital discharge and to investigate to what extent their assessments are associated with the system level of municipality and with vertical coordination between community and hospital care services. We thereby differentiate between nurses working in homecare, nurses working in residential care and nurses working in nursing homes. Variations in perceived staffing adequacy across these three settings are of interest as they differ substantially in user profiles, type of services provision and in the extent to which they

require advanced nursing. These different services profiles have become more pronounced in the wake of recent decentralization policies (Tingvold & Magnussen, 2018).

2.2 | Design

We used data from a cross-sectional nationwide web-based survey among nurses working in municipal care services in Norway. Data were collected in 2017.

2.3 | Participants and context

A national register of nurses fitting our inclusion criteria does not exist, but most Norwegian nurses are members of the Norwegian Nurses Organisation (NNO). The NNO granted access to e-mail addresses from all 20,714 NNO members who were registered as working in the municipalities. Initial contact with the nurses was made with an e-mail containing information and a link to the questionnaire. Only nursing staff working in home care nursing or nursing homes and who were involved in the care of older people (65 years and older) were included in the survey. Nursing staff working in administration or other municipal services were not included. The web survey included screening questions that routed out nursing staff who did not fulfil the inclusion criteria. Reminders were sent out 1, 2 and 3 weeks after the initial e-mail contact. A total of 5,884 community nurses responded and 5,527 nurses indicated that their workplace received older patients (aged 65 years and older). The analyses in this paper are based on 3,461 nurses working in homecare services, residential care settings or nursing homes, who responded to all survey questions on staffing. Ninety-five percentage of these were women. The final sample comprised 1,364 nurses working in homecare services, 505 nurses working in residential care and 1,592 nurses working in nursing homes. Of these, 540 respondents did not provide information about the municipality they were working in. Their responses to the survey questions on staffing adequacy and collaboration with the hospital did not differ significantly ($P_{\text{test}} > 0.05$) from the nurses who did provide information about the municipality.

This paper includes 352 (83%) of the, in total, 426 municipalities. The smallest municipality represented in this study had 807 inhabitants and the largest municipality (Oslo) had 673,468 inhabitants. In this study, the number of responding community nurses in each municipality ranged from 1–138. Fifty municipalities were represented with only one nurse.

2.4 | Data collection

The questionnaire built on questions tested in previous data collections on discharge planning (Gautun & Syse, 2017; Hellesø et al., 2005) and contained 32 questions or batteries of questions

on continuity in care services for older patients following hospital discharge. The median time it took to complete the questionnaire was 15 min. A first set of questions asked about the workplace (care setting). The second part of the questionnaire was about contacts with the hospital in the discharge of older patients, the quality of care transition from the hospital to the municipality and the quality of the care services provided in the municipality, including staffing adequacy. The third part of the questionnaire was about the quality of care transition for older people between different municipal care services. The questionnaire finished with questions on background information, including gender, age, work experience, management position and education.

2.5 | Ethical considerations

The survey was reported to the Norwegian Centre for Research Data. Responses to the questionnaire were considered informed as consent and respondents were guaranteed anonymity.

2.6 | Validity, reliability and rigour

Content validity of the questions on staffing adequacy and vertical coordination is strengthened as these questions were derived from qualitative interviews with hospital and community care nurses and have been used in an earlier national study on collaborations between hospital and community care settings in the discharge of older patients. In addition, a pilot study with 41 community care nurses was conducted prior to the survey in 2017 to assess the content validity of all questions included.

2.6.1 | Dependent variable: Staffing adequacy

Community nurses' assessments of staffing adequacy in services for older patients discharged from the hospital were measured through five statements: (1) Services have sufficient staffing; (2) The number of unqualified workers is too high; (3) Services are sufficiently staffed with registered nurses; (4) Services are sufficiently staffed with other qualified care workers (e.g. licensed practical nurse and others); and (5) There are too many unfilled posts. Responses are given on a five-point Likert scale, ranging from 1 (Fully agree) - 5 (Fully disagree). All five items were recoded and summated into a summary score ranging from 5-25, with higher scores indicating more positive perceptions of staffing adequacy. Cronbach's alpha of this scale is 0.75, indicating good reliability.

2.6.2 | Independent variables

Information on the municipality, that is population size and age structure, economic flexibility and service profile, was derived

from the national administrative database for Municipality-State-Reporting, KOSTRA, at Statistics Norway. All data refer to statistics from 2017. *Population size and age structure* include the number of inhabitants (grouped into five categories: (1) Less than 5,000; (2) 5,000-9,999; (3) 10,000-19,999; (4) 20,000-49,999 and (5) 50,000 or more) and the share of persons 80 years and older of the total population in the municipality. We also included a measure of the municipality's centrality, based on travel distances for inhabitants to place of work and services. The original centrality index ranged from 0 (least central; i.e. almost no workplace or services within 90 min traveling) to 1,000 (most central) and was categorized into six groups ranging from 1 (most central; i.e. Oslo and surroundings) to 6 (least central) (Høydahl, 2017). *Financial flexibility* refers to the unrestricted revenues in Norwegian Crowns (NOK) per 1,000 inhabitants and the nett expenses to municipal health services as share of the total operational expenses. Unrestricted revenues consist of the block grant and revenue from income tax and capital tax. Information on the municipality's *service profiles* included: (a) number of full-time equivalents (FTEs) in municipal healthcare services per 10,000 inhabitants; (b) share of homecare recipients 80 years and older of the total population 80 years and older; (c) share of nursing home users 80 years and older of the total population 80 years and older and (d) number of nursing home places per inhabitant 80 years and older.

Vertical collaboration

Community nurses' assessments of collaboration with hospital nurses were measured with the following items. *Overall, to what extent do you experience that the collaboration with hospital nurses on the discharge of older patients is satisfactory?* Responses were given on a 5-point scale, ranging from 1 (To a very large extent) - 5 (Not at all). We combined this item with the following three statements into a summated rating scale assessing vertical coordination: (a) *Hospital nurses have a different understanding than me when it comes to the patient's needs;* (b) *Hospital nurses should have more contact with the services in which I work about the discharge of older patients;* and (c) *Hospital nurses have adequate contact with the services in which I work about the discharge of older patients.* Responses were given on a 5-point scale ranging from 1 (Strongly disagree) - 5 (Strongly agree). The third item was recoded so that higher scores indicated less positive assessments. The summated rating scale ranged from 4-20, with higher scores indicating less positive experiences with vertical coordination. Cronbach's alpha was 0.70.

2.6.3 | Potential confounders

Perceptions of staffing adequacy, as well as of vertical coordination, may correlate with individual qualifications of the nursing staff, such as holding a management position, holding a part-time position (i.e. <35 hr/week), the number of years working at the current workplace and educational attainment. Community care services in Norway are characterized by a large share of nurses working part-time. Part-time

work may imply less connection and commitment to the work place, the care users and to the profession. The level of post-qualifying education was measured as an ordinal variable: (0) No post-graduate education; (2) 1 year or less; (2) More than 1 year; and (3) Master degree.

2.7 | Data analysis

We used descriptive statistics (crosstabs, chi-square statistics, means, standard deviations, analyses of variance) and bivariate Pearson correlations. In addition, we conducted multilevel regression analyses (Snijders & Bosker, 1999) to assess variation in nurses' assessments across and within municipal context and to account for possible clustering of responses from nurses working in the same municipalities. Multilevel analyses also allow more efficient estimation of the effects of structural characteristics of the municipality. We used empty random intercept models, without explanatory variables, to estimate the intraclass correlation coefficient (ICC). The ICC indicates the degree of clustering of community nurses' responses in municipalities and how much of the total variation in nurses' assessments of staffing adequacy is at the municipal level. The contribution of subsequent sets of variables was assessed using the likelihood ratio test (AIC). The reduction in AIC from one model to the previous model can be tested using a Chi-squared-difference statistic. For all statistical tests, we applied a critical value (α) of 5%. We calculated the proportional reduction in prediction error (Snijders & Bosker, 1999), to approximate estimates of explained

variance at the individual and municipal level. We conducted separate analyses for nurses working in homecare, nurses in residential care and nurses working in nursing homes.

3 | RESULTS

3.1 | Sample statistics

Table 1 provides an overview of the sample characteristics of the community nurses. All in all, 16.8% of the nurses had a management position and one-third of the respondents had been working for more than 10 years at the same place. Working part-time was more frequent ($P_{\text{chi-square}} < 0.05$) among nurses working in nursing homes (50.2%) than nurses from the two homecare settings (42.8 and 45.8% in homecare and residential care). Almost half of the nurses in the sample (48.6%) reported having a post-qualifying training, which was a little more frequent among nurses working in nursing homes.

Table 2 presents an overview over the sample characteristics of the 352 municipalities included in the analyses of this paper. Age structure, economic flexibility and service profiles varied significantly across municipality groups ($p_{\text{ANOVA}} < 0.001$). For example compared with the largest municipalities, municipalities <5,000 inhabitants had a larger share of persons 80 years and older, higher unrestricted revenues per inhabitant, a higher number of FTEs and a larger share of people ≥ 80 years using homecare services as well as nursing homes.

TABLE 1 Descriptive statistics study sample: nurses working in community care settings, number (N) and percentages (%)

	Home care nurses, % (N)	Residential care nurses, % (N)	Nursing home nurses, % (N)	Total, % (N)
Management position*	14.6 (192)	18.4 (90)	18.1 (276)	16.8 (558)
Number of years experience workplace				
0–2 years	17.6 (231)	20.9 (102)	21.2 (322)	19.7 (655)
3–5 years	25.1 (330)	24 (117)	24.9 (378)	24.8 (825)
6–10 years	27.1 (357)	28.1 (137)	23.4 (355)	25.5 (849)
≥ 11 years	30.2 (397)	27.1 (132)	30.6 (465)	30 (994)
Parttime position (yes)***	42.8 (561)	45.8 (223)	50.2 (759)	46.6 (1,543)
Post-qualifying training*				
No	53.4 (701)	51.9 (252)	49.5 (750)	51.4 (1,703)
<1 year	28 (367)	24.7 (120)	26.6 (402)	26.8 (889)
≥ 1 year	15.7 (206)	18.9 (92)	19.4 (294)	17.9 (592)
Master (MA)	2.9 (38)	4.5 (22)	4.5 (68)	3.9 (128)
Municipality size***				
<5,000	12.9 (151)	21.7 (92)	18 (238)	16.5 (481)
5,000–9,999	13 (152)	15.8 (67)	14.7 (195)	14.2 (414)
10,000–19,999	15.3 (179)	18.9 (80)	14.1 (187)	15.3 (446)
20,000–49,999	24.2 (282)	25.3 (107)	24.1 (319)	24.3 (708)
>49,999	34.5 (403)	18.2 (77)	29 (384)	29.7 (864)

Note: Chi-squared tests: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 2 Sample characteristics of municipalities ($N = 352$) represented in the survey; across municipality size; Mean and Standard Deviation (SD)

Municipality size	<5,000, Mean (SD)	5,000–9,999, Mean (SD)	10,000–19,999, Mean (SD)	20,000–49,999, Mean (SD)	>49,999, Mean (SD)	Total, Mean (SD)
Number of municipalities (N)	160	83	51	42	16	352
Population size, centrality and age structure						
Number of inhabitants***	2,693 (1,141)	7,027 (1,410)	14,021 (2,818)	29,014 (7,669)	133,612 (156,543)	14,448 (42,486)
Share of persons aged 80+***	6.0 (1.2)	4.8 (1.1)	4.1 (0.9)	4.2 (0.8)	3.9 (0.7)	5.1 (1.38)
Centrality 0 (least central) –1,000 (most central) (median)***	572.3 (80.4)	697.4 (76.4)	775.4 (77.9)	831.0 (62.6)	897.6 (56.1)	675.6 (131.5)
Economic flexibility						
Unrestricted revenues per inhabitant (NOK)***	66,565.3 (8,339.9)	55,106.0 (4,527.4)	52,677.7 (3,600.7)	50,757.1 (3,422.3)	52,650.8 (4,186.8)	59,332.4 (9,252.0)
Nett expenses to municipal health services as share of total operational expenses***	5.8 (1.3)	4.9 (1.0)	4.4 (0.6)	4.5 (0.7)	4.3 (0.6)	5.2 (1.2)
Service profiles						
Share of homecare recipients 80 + of the total 80 + population***	37.0 (6.1)	35.6 (5.9)	32.9 (4.4)	31.3 (4.6)	28.8 (2.7)	35.0 (6.0)
Share of nursing home users 80 + of the total 80 + population***	15.5 (4.7)	12.0 (3.6)	11.4 (3.2)	11.3 (3.1)	13.0 (2.4)	13.5 (4.4)
Number of nursing home places per population 80+***	22.5 (6.3)	17.9 (4.7)	17.9 (4.6)	16.6 (4.2)	19.2 (3.5)	19.9 (5.9)
Number of FTEs, in municipal healthcare services per 10,000 inhabitants***	445.9 (109.6)	356.3 (87.0)	300.2 (74.6)	296.1 (50.7)	279.6 (44.8)	377.2 (112.6)

Note: ANOVA across municipality groups: *** $p_{ANOVA} < 0.001$.

Abbreviation: FTE, Full-time equivalents.

Source: KOSTRA 2017.

3.2 | Descriptive statistics

Figure 1 shows the distribution of the responses from community nurses across the different care settings (homecare, residential care and nursing homes) on the five single items measuring staffing adequacy in services to older patients after hospital discharge. The distribution of responses differed significantly across care settings for all five items ($P_{\text{chi-square}} < 0.001$). The percentage of nurses agreeing (fully or partly) with the statement 'Services have sufficient staffing to receive older patients from the hospital' was like the percentage who did not agree (fully or partly). Compared with nurses working in homecare, a somewhat larger percentage of nurses working in nursing homes and residential care disagreed (fully or partial) that staffing was adequate (44 versus 48%). Overall, 40% of the nurses either partly or fully agreed with the statement 'Services are sufficiently staffed with registered nurses'. The percentage of homecare nurses agreeing (partly or fully) that their services were sufficiently staffed with registered nurses was significantly higher ($P_{\text{Chisquare}} < 0.05$) compared with nurses working in nursing homes and residential care (45 versus 36 percent in both nursing home and residential care). Most nurses (55%) agreed (partly or fully) that services were sufficiently

staffed with other skilled health workers, with a significantly larger share of homecare nurses agreeing (59%) compared with the other two groups of nurses. Almost three out of four (72%) nursing home nurses, 64% residential nurses and 60% homecare nurses agreed (partly or fully) with the statement 'The number of unqualified care workers is too high'. The percentage of nurses agreeing (fully or partial) with the item 'There are too many unfilled posts' was somewhat lower among homecare nurses and residential nurses (44 and 46%) compared with nursing home nurses (53%). In sum, nursing home nurses tend to perceive staffing as less adequate than in, in particular, homecare nurses.

The average score on the summated rating scale measuring community nurses' assessments of staffing adequacy was 13.9 (SD 4.7), with significantly ($p_{ANOVA} < 0.001$) more positive scores for nurses working in homecare (14.6; SD 4.7) compared with nursing home- (13.4; SD = 4.7) and residential nurses (13.9; SD 4.7). The average score on the scale measuring Vertical Collaboration was 12.9 (SD 2.7) also differed across care settings ($p_{ANOVA} < 0.001$), with lower scores (i.e. more positive ratings of collaboration) for nursing home nurses (12.5; SD 2.7) compared with nurses in homecare (13.4; SD 2.6) and residential care (13.2; SD 2.7).

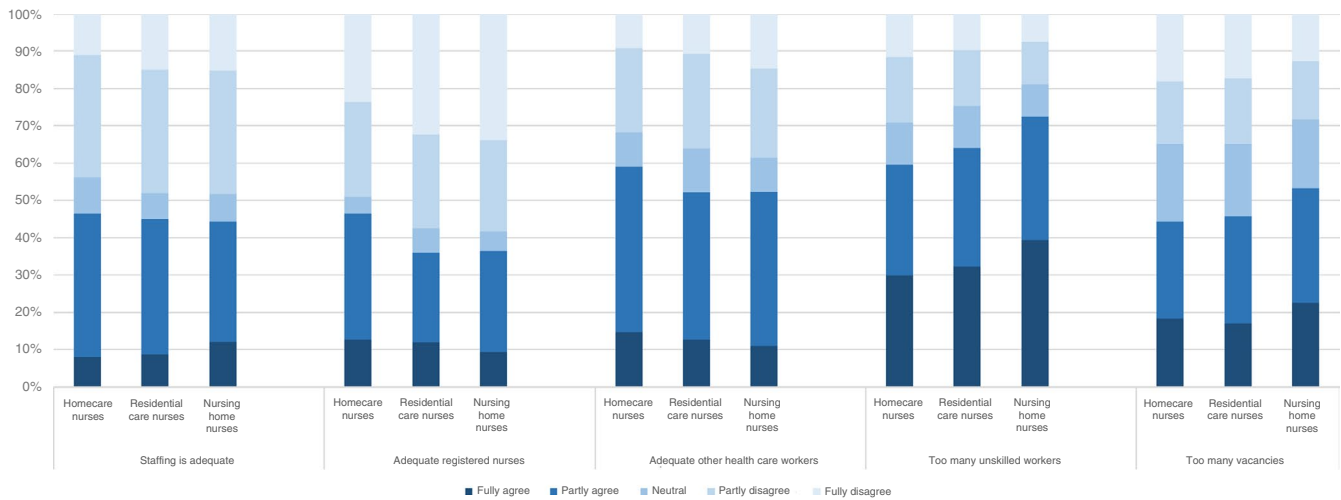


FIGURE 1 Response distribution five single items of Staffing Adequacy across community care settings (Homecare, Residential care and Nursing homes); percentages (%) [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)]

Table 3 shows the bivariate correlations (Pearson's r) between dependent and independent variables. Community nurses' assessments of staffing adequacy were statistically significant and negatively correlated with the municipality's size, the share of the population 80 years and older and the share of nursing home users in the population aged 80 years and older. Higher scores on the scale measuring vertical collaboration (worse collaboration) were associated with more negative assessments of staffing adequacy. Nurses with a management position had significantly more positive assessments of staffing adequacy compared with nurses who did not have a management position.

3.3 | Multilevel analyses of nurses' assessments of staffing adequacy

Multivariate multilevel regression analyses were conducted for each group of community nurses separately to provide a more accurate description of associations with nurses' assessments of staffing adequacy in the municipality (system) context. The first step in the multilevel analyses was to estimate the empty model with a random intercept (Table 4, Model 1). This model provides information about the degree of clustering in the data, that is the extent to which responses of community nurses are nested within municipalities. The strongest clustering was found for homecare nurses, where 3.64 of the total variation in assessments of staffing adequacy was at the level of municipality. This corresponded to an intraclass correlation coefficient (ICC) of 0.17, suggesting that 17% of the total variation in staffing adequacy scores is at the municipal level. The ICCs for nurses working in residential care and in nursing homes were 0.14 in both instances.

The second step was to enter nurses' individual characteristics as potential confounders for the associations of interest (Table 4, Model 2). Only characteristics that showed significant ($p < 0.05$) bivariate correlations (r) in Table 3 were included in the model. Holding

a management position remained statistically significant in the multivariate model. Community nurses with a management position had more positive ratings of staffing adequacy compared to nurses not holding a management position. Associations were similar across groups of nurses (homecare, residential care and nursing homes).

Municipality (system)-level variables were entered in the third step (Table 5, Model 3). The higher the municipality's share of persons aged 80 years and older, the less adequate community nurses perceived the staffing at their workplace. In addition, the negative association of municipality size with ratings of staffing adequacy indicated that nurses working in smaller municipalities had more positive experiences of staffing adequacy compared with those working in larger municipalities. The fourth step was to investigate the association of vertical collaboration as perceived by community nurses, over and above the individual nursing characteristics and municipal context. More positive assessments of vertical collaboration were significantly and positively associated with perceived staffing adequacy, independent of individual nurse qualifications, in all three care settings. The association of municipality size was no longer statistically significant for homecare and residential nurses. Table 5 (Model 4) shows the multivariate estimates for this model.

The reduction in AIC from one model to the next was significant across all model steps, indicating that adding explanatory variables contributed to significant improvement in model fit. Furthermore, for each step we calculated the proportional reduction in prediction error (Snijders & Bosker, 1999), which is considered a good approximation of explained variance at the individual and municipal level. Adding nurses' experience and management position explained between 1% and 3% of the proportion of variance at the individual level of nurses and did not contribute to any explained variance at the level of municipality, suggesting that there were no compositional effects. Adding the municipality characteristics (Model 3) contributed to a 6% proportional reduction in municipal-level variation in homecare nurses' assessments of staffing adequacy. The corresponding percentages for residential care nurses and nursing home

TABLE 3 Bivariate (Pearson) correlations of community nurses' ratings of Staffing Adequacy, with assessments of vertical collaboration, individual and municipality's characteristics

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Summated scale Staffing Adequacy	1														
2 Summated scale Collaboration with hospital	-0.181**	1													
3 Working part-time (0 = No/1 = Yes)	-0.035	-0.054**	1												
4 Post-qualifying education (0 No-3 Master degree)	0.047*	0.037	-0.151**	1											
5 Management position (0 = No/1 = Yes)	0.136**	0.015	-0.324**	0.290**	1										
6 Number of years at current work place	0.071**	-0.029	-0.016	0.127**	0.151**	1									
7 Number of inhabitants	-0.116**	0.038	-0.022	-0.038*	0.026	-0.098**	1								
8 Centrality index (0-1,000)	-0.035	0.077**	-0.043*	-0.03	-0.029	-0.197**	0.548**	1							
9 Share population 80+	-0.044*	-0.024	0.023	0.017	0.016	0.123**	-0.380**	-0.681**	1						
10 Share net expenses to municipal health services of total operational expenses	0.014	-0.060**	-0.009	-0.033	0.01	0.076**	-0.316**	-0.561**	0.392**	1					
11 Unrestricted revenues per inhabitant (NOK)	-0.029	-0.070**	-0.004	0.014	0.024	0.120**	0.084**	-0.573**	0.506**	0.367**	1				
12 Number of FTEs in municipal healthcare services per 10,000 inhabitants	-0.018	-0.022	0.003	0.055**	0.042*	0.140**	-0.407**	-0.744**	0.778**	0.375**	0.549**	1			
13 Number of nursing home places per population 80+	-0.001	-0.026	-0.046*	0.009	0.059**	0.037	0.198**	-0.139**	-0.01	0.170**	0.393**	0.162**	1		
14 Share of nursing home users 80 + of the total 80 + population	-0.041*	-0.02	-0.049**	0.005	0.058**	0.013	0.268**	-0.121**	0.105**	0.167**	0.396**	0.197**	0.824**	1	
15 Share of homecare recipients 80 + of the total 80 + population	0.014	-0.041*	0.059**	0.01	-0.01	0.141**	-0.322**	-0.610**	0.470**	0.325**	0.336**	0.444**	-0.175**	-0.211**	1

Note: Bivariate Pearson Correlations (r): * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$
 Abbreviations: FTEs, Full-time equivalents; NOK, Norwegian Kroner.

TABLE 4 Multilevel random intercept regression model of nurses' assessments of staffing adequacy (5–25); homecare nurses, residential nurses and nursing home nurses. Model 1 (Empty model) and Model 2; nurses are nested within municipalities; unstandardized coefficients and standard errors (SE)

Fixed effect	Model 1: Empty model			Model 2: Nurse characteristics		
	Home care, coefficient (SE)	Residential care, coefficient (SE)	Nursing home, coefficient (SE)	Home care, coefficient (SE)	Residential care, coefficient (SE)	Nursing home, coefficient (SE)
Intercept	14.76 (0.20)	14.03 (0.27)	13.56 (0.18)	14.62 (0.28)	13.84 (0.43)	12.73 (0.27)
Post-qualifying education 0 = No - 3 = Master				-0.25 (0.17)	0.09 (0.27)	0.19 (0.15)
Number of years at current work place				0.05 (0.10)	-0.08(0.18)	0.16 (0.09)
Management position (0 = no/1 = yes)				1.54 (0.41)***	1.57 (0.62)**	2.06 (0.36)***
Random effect	Variance component	Variance component	Variance component	Variance component	Variance component	Variance component
Municipal level variance	3.64 (0.86)	2.91 (1.32)	3.15 (0.85)	3.77 (0.91)	3.17 (1.3)	3.31 (0.85)
Nurse level (residual) variance	17.74 (0.90)	18.64 (1.64)	19.52 (0.90)	17.32 (0.85)	17.71 (1.60)	18.56 (0.87)
Deviance (AIC)	6,282.51	2,293.29	7,173.20	6,170.10	2,265.34	7,045.38

Note: Abbreviation: AIC, Akaike Information Criterion.

T-test: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

nurses were nine and 18% respectively. Assessments of vertical collaboration contributed to an additional proportional reduction in individual-level variance of 4 (in homecare nurses and nursing home nurses) and 9% (nursing home nurses). For homecare nurses, vertical collaboration contributed to explain an additional 11% of the variation between municipalities, suggesting that municipalities differed substantially in homecare nurses' average ratings of vertical coordination. For residential care nurses and nursing home nurses, vertical coordination did not reduce any of the municipal-level variation.

4 | DISCUSSION

This paper contributes to the scarce national and international research literature on nurse staffing in community healthcare services, addressing the pressing challenges of staffing and skill-mix in long-term care provision to older adults (OECD, 2019; WHO, 2020). Although situated in a Norwegian setting, the study is relevant for social and long-term care settings in other European countries as well. Using nation-wide data of community nurses nested within municipalities, the empirical findings illustrate that adequate staffing in care transitions of older patients is not merely a matter of numbers but involve system-level conditions and new models of cross-sectoral collaboration.

Our findings indicated large variations in assessments of staffing adequacy. For example whereas almost half of the nurses experienced inadequate staffing in general, a similar share of nurses indicated that staffing was adequate, suggesting that staffing is not necessarily considered a challenge in all community care services. Another clear finding was that most community nurses agreed that there were too many unqualified care workers at their workplace. This was the case for almost three out of four nurses from nursing homes. Our finding is in line with recent national statistics showing a continuing increase in the number of FTE's in unqualified care workers (Helsedirektoratet, 2018) and may reflect the substitution of cheaper care assistants for more expensive nurses for cost-containment purposes (Gautun et al., 2016). Our findings are consistent with international research emphasizing that services may benefit from a more balanced skill-mix by taking a closer look at whether and when unqualified staff are being used to supplement, complement or replace qualified nurses (Blay & Roch, 2020; Dubois & Singh, 2009). In Norway, strategies at the national and municipal level target enhancement of competences at all levels, including education of unqualified care workers. So far, most funding is however used in relation to career enhancement of licenced practical nurses.

Assessments of staffing adequacy varied significantly across the three care settings, with the least positive ratings of staffing adequacy among nurses from nursing homes and the most positive ratings among homecare nurses. These findings are consistent with a previous study underlining the self-reinforcing issues of recruitment difficulties, higher rates of unqualified staffing and higher rates of sickness absence among nursing staff in nursing homes (Gautun et al., 2016). Another possible explanation for the

TABLE 5 Multilevel regression models for community nurses' assessments of staffing adequacy (Model 3: Municipality characteristics) and Model 4 (Vertical Coordination); unstandardized coefficients and standard errors (SE)

Fixed effect	Model 3: Municipality characteristics			Model 4: Vertical coordination		
	Home care, coefficient (SE)	Residential care, coefficient (SE)	Nursing homes, coefficient (SE)	Home care, coefficient (SE)	Residential care, coefficient (SE)	Nursing homes, coefficient (SE)
Intercept	18.40 (1.44)	18.08 (1.95)	20.01 (1.26)	18.02 (1.39)	17.24 (1.93)	19.51 (1.25)
Post-qualifying education 0 = No - 3 = Master	-0.26 (0.17)	0.15 (0.27)	0.22 (0.15)	-0.24 (0.16)	0.30 (0.26)	0.25 (0.15)
Number of years at current work place	0.06 (0.10)	-0.14 (0.19)	0.14 (0.09)	0.05 (0.09)	-0.13 (0.18)	0.13 (0.09)
Management position (0 = no/1 = yes)	1.57 (0.41)***	1.58 (0.63)*	2.07 (0.35)***	1.63 (0.46)***	1.52 (0.61)*	2.07 (0.35)***
Vertical coordination -mean centred (high = poor coordination)				-0.31 (0.05)***	-0.42 (0.09)***	-0.33 (0.05)***
Municipality characteristics						
Share population 80 years and older	-0.58 (0.20)**	-0.65 (0.28)*	-0.89 (0.17)***	-0.54 (0.19)**	-0.60 (0.28)*	-0.86 (0.17)
Share of nursing home users 80 years + of total population 80 years+	-0.001 (0.05)	0.05 (0.07)	-0.06 (0.05)	0.007 (0.05)	0.06 (0.07)	-0.05 (0.05)
Municipality size (1 = smallest - 5 = largest)	-0.39 (0.18)*	-0.57 (0.24)*	-0.82 (0.15)***	-0.25 (0.17)	-0.45 (0.23)	-0.78 (0.15)***
Random effect	Variance component	Variance component	Variance component	Variance component	Variance component	Variance component
Municipal level variance	3.42 (0.86)	2.62 (1.31)	2.33 (0.71)	2.87 (0.77)	2.91 (1.30)	2.43 (0.70)
Nurse level (residual) variance	17.30 (0.85)	18.11 (1.64)	18.48 (0.86)	16.97 (0.83)	16.69 (1.54)	17.59 (0.81)
Deviance (AIC)	6,160.15	2,224.40	6,986.07	6,128.53	2,203.09	6,936.89

Note: T-test: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Abbreviation: AIC, Akaike Information Criterion.

less positive ratings of nursing home nurses is that they may have a better overview of the absence and substitution of their colleagues. The 'workplace' of homecare nurses is the home of the care recipient and thus they work more solitary compared with nursing home nurses.

Irrespective of care setting, community nurses holding a management position had more positive assessments of staffing adequacy. Holding a management position implies responsibility for staff planning, which, within the boundaries of available resources, is a complex and time-consuming effort, balancing an optimal match between user needs and staff qualifications. Nurses in a management position may thus not experience the staffing situation in the same way as nurses providing hands-on care to recipients. Whereas service managers base their responses on a more comprehensive account of the care situation, assessments of staffing among nurses without a management position are likely to be shaped by the actual care provision. Assessments of staffing adequacy were independent of nurses' educational attainment and number of years of experience.

4.1 | The importance of the system context of the municipality

Our study showed a significant clustering of nurses' assessments of staffing adequacy in municipalities. Nurses working in the same municipality had more similar assessments of staffing adequacy than nurses working in other municipalities. For nursing home nurses, 18% of the municipal-level variation in staffing adequacy could be explained by the municipality's population size and age structure. Similar, but less strong, associations were found for homecare nurses and residential nurses. These are independent associations, meaning that a higher share of older persons in the municipality is associated with less positive average assessments of staffing adequacy in large as well as smaller municipalities. Vice versa, independent of the municipality's age structure, municipalities with a larger number of inhabitants have, on average lower ratings of staffing adequacy than smaller municipalities. A greater share of older persons reflects a higher demand for community services, which in turn is associated with community nurses' perceived need for staffing. In a similar manner are municipalities with a higher number of inhabitants likely to pose greater demands for staffing than smaller municipalities. Large municipalities generally have complex care systems that require a greater 'organization of work' (Allan, 2014) by community nurses in the discharge of older patients. Our study did not find a significant association of staffing adequacy with the municipality's economic flexibility or services profile. On the one hand, this non-significant finding suggests that economic and profile factors are of minor importance for staffing adequacy, that is rich municipalities do not have better staffing adequacy than poorer municipalities. On the other hand, it suggests the importance of lower levels of service organization, which will be especially the case in larger

municipalities. For example different nursing homes in the same municipality can have quite different degrees of economic flexibility. Alternatively, the effect of municipality size may account for the aggregated impact of differences in economic flexibility and services profiles.

4.2 | The importance of vertical collaboration

Independent of municipality context, care setting and individual nursing characteristics, community nurses' assessments of staffing adequacy were positively associated with better perceived vertical collaboration with the hospital. A stronger focus on models of vertical collaboration may thus be important for staffing adequacy in community care services and especially in homecare services where vertical coordination explained a substantial proportion of variance at the municipal level. This is in line with earlier studies indicating that raised awareness and the establishment of common goals are the first steps needed to bridge the divide between staff from hospital and community care settings (Hellesø & Fagermoen, 2010; Payne et al., 2002). To date, the organization and professional culture of hospitals has not encouraged hospital nurses to take a more active role in their collaborations with community care nurses. In Norway, the focus is predominantly on clinical pathway models for specific diseases, which make use of in-hospital pathway coordinators. Such models can (at best) be described as an 'Outreach interface model' (Guerin et al., 2013), where hospital staff implement aspects of the discharge plans in the community, a model that also could be suitable for older adults with specialized needs. However, using exclusively a disease-specific approach will stimulate a further fragmentation of care services that might not be effective in care for older people with complex care needs. Guerin (Guerin et al., 2013) defined the current traditional approach of staff staying in their respective hospital or community environments and communicating through electronic communication, telephone and/or written communication and hospital staff planning discharges and referring to community staff, as most suitable for straightforward discharges. A third option lies in the so-called 'In-reach Interface Model', where community services are located in the acute care sector and are involved in discharge earlier. This model implies a role expansion for community nurses as it focuses on nurse-led outpatient follow-ups, whereby community nurses oversee discharge planning and post-discharge outpatient follow-up. The 'Independent Interface Model' involves the use of an independent care-coordinator, who is not employed by the hospital or community service and who works across the interface to facilitate discharge. Both the In-reach Interface Model and the Independent Interface Model are likely to best address the needs of older adults with complex discharge needs. In addition to ongoing national policies aimed at improving attraction, deployment, retention and motivation of the nursing workforce, efforts to ensure staffing adequacy in community care must address the local levels of nursing practice. Introducing effective nurse-led models of care coordination may be crucial in tackling the growing need for increased nurse staffing in community care. Such models should account for

varying demographic contexts where different community care services are provided.

4.3 | Limitations

Despite its strengths, this study has also some limitations that could be addressed in future research. First, assessments of staffing adequacy may vary substantially between services in the same municipality, reflecting differences in patient populations and illness severity, as well as economic resources. Second, although the use of a survey design is considered an appropriate way to study variations in community nurses' assessments of staffing adequacy, there are also some drawbacks related to this method. Our measure is a summarized and aggregated measure, not distinguishing between time or units. In practice, staffing is managed on a unit-by-unit, day-by-day and shift-by-shift basis. Furthermore, the cross-sectional nature of the study precludes any conclusions on causality. As we mentioned in the introduction, staffing adequacy is both a determinant and determined by, organizational and system context. The association between staffing adequacy and vertical collaboration is thus likely to be a reciprocal one. Finally, information on the exact number of eligible nurses working in municipal care services was not available. We were therefore not able to calculate response rates and assess possible sampling bias. However, this study included a relatively large number of community nurses across a wide demographic and geographical spectrum, strengthening the representativeness of the results.

5 | CONCLUSION

Despite a general and pressing concern of nurse staffing shortages in community care settings, there are large variations between community nurses in assessments of staffing adequacy in care services for older patients following hospital discharge. Healthcare providers, nurse managers and policy makers benefit from a stronger focus on rebalancing skill-mix and on new models of vertical coordination in addressing current and future nurse staffing shortages in care services for older people following hospital discharge. Longitudinal studies at the level of local care services are needed to understand how staffing adequacy is affected by recruitment and retention strategies in different municipalities, as well as by different models of vertical collaboration.

CONFLICTS OF INTEREST

No conflict of interest has been declared by the authors.

AUTHORS' CONTRIBUTIONS

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE, <http://www.icmje.org/recommendations/>): (1) substantial contributions to conception and design, acquisition of data, or analysis and interpretation

of data; (2) drafting the article or revising it critically for important intellectual content.

PEER REVIEW

The peer review history for this article is available at <https://publons.com/publon/10.1111/jan.14636>.

DATA AVAILABILITY STATEMENT

The dataset that was generated and analysed during the current study is not publicly available since it contains information (i.e. municipality) that could compromise research participant confidentiality. The data are stored on a secure server at Oslo Metropolitan University. Access to the data has been granted to the project's investigators for a designated period, after which anonymised data will be made available for research purposes through the archives at the Norwegian Centre for Research Data (NSD).

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